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MONITORING STUDENTS' LEARNING OUTCOMES AND ASSESSING INDIVIDUAL DEVELOPMENT WITH ARTIFICIAL INTELLIGENCE IN A DIGITAL EDUCATIONAL ENVIRONMENT

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ABSTRACT

This paper provides a scientific and methodological analysis of monitoring students' learning outcomes and assessing their individual development with artificial intelligence (AI) in a digital educational environment. It examines the content of learning outcome monitoring, the components on which it relies (data sources, indicators, analytical methods and feedback), and the opportunities offered by AI-based learning analytics. It also defines three groups of criteria for assessing individual development: the dynamics of results, the achievement of learning goals, and independent work and reflection. As a result, a six-stage methodology is proposed in which the teacher keeps the final pedagogical decision. The methodology is intended to support the timely and individualised assessment of students in higher education institutions.

Keywords: digital educational environment, artificial intelligence, learning outcomes, monitoring, individual development, learning analytics, assessment, independent learning.

The digitalisation of higher education has changed the way students learn. Alongside traditional classes, blended, distance and independent forms of learning now play a central role. In these forms, it is often not visible how a student performs each task, where he or she struggles, or how his or her competence develops over time. Research on AI in education indicates that intelligent systems can support personalised

teaching and assessment [1]. Analysing large volumes of learning data makes the process of monitoring students more precise and more timely than traditional control measures.

The relevance of the topic follows from the rapid development of digital technologies and the growing demands on the quality of education. Monitoring of learning outcomes is not only a tool for control but also a basis for individual support of each student.

The purpose of the study is to clarify the content of monitoring students' learning outcomes with AI in a digital educational environment and to propose a stepwise methodology for assessing their individual development.

1. The Content of Learning Outcome Monitoring

Monitoring of learning outcomes is the systematic collection, analysis and feedback of data on a student's mastery, activity and task results. Its main components are data sources (test results, task completion time, error analysis, activity in forums and projects), a system of indicators, analytical methods and a feedback mechanism. In contrast with traditional control, monitoring in a digital environment is carried out throughout the course rather than only at its end. Learning analytics is the field that measures, collects, analyses and reports data about learners in order to understand and optimise learning [2]. Its essential aim is to understand the learning process, not merely to measure results [3].

2. Opportunities of AI-Based Learning Analytics

AI offers several opportunities for learning analytics: step-by-step identification of a student's knowledge level, early detection of students at risk, adaptation of learning tasks to the student's level, and recognition of typical types of errors. These opportunities allow the teacher to build an individual profile that changes over time. Studies of AI applications in higher education note that the role of educators is often under-represented in such research [4]. Accordingly, AI should be understood as a tool

that supports the teacher rather than replaces him or her [5]. The use of AI should also be oriented to learners' needs [6].

3. Criteria for Assessing Individual Development

The individual development of a student can be assessed by three groups of criteria. The first is the dynamics of results, that is, the change between the baseline and the current results. The second is the level of achievement of the learning goals. The third covers independent work and reflection, including the ability to plan tasks, to seek help when needed and to analyse one's own activity. Automated personalised feedback has been shown to improve learning gains in an intelligent tutoring system [7]. Research in Uzbekistan indicates that AI-based assessment can increase the effectiveness and objectivity of evaluation, while limited teacher digital skills and data privacy concerns remain challenges [8]. Criteria for assessing students' skills in using AI tools have also been proposed [9].

4. Stepwise Methodology for Assessing Individual Development

On the basis of the analysis presented above, the following stepwise methodology is proposed:

1) Setting learning goals and baseline diagnostics – the outcomes of each module are defined and the student's initial level is determined through a test;

2) Data collection – tasks, tests, time and activity indicators are recorded automatically through the learning management system;

3) AI-based analysis – typical error types, the dynamics of mastery and students at risk are identified;

4) Individual assessment – the student's current results are compared with the baseline and previous indicators, and the level of development is determined;

5) Feedback and an individual plan – concrete recommendations are given to the student, and the teacher confirms the analysis and designs an individual learning plan;

6) Reflection and re-assessment – the student independently analyses his or her results and sets the goals of the next stage.

The main advantage of this methodology is that it combines the continuous observation of student activity with an individual approach. The results obtained from digital data show a student's strengths and weaknesses more precisely. Empirical testing of the methodology and statistical analysis of its results are the tasks of future research.

In conclusion, monitoring students' learning outcomes with artificial intelligence in a digital educational environment allows timely and individualised assessment of their development. However, this potential can be used effectively only when there is a scientifically grounded methodology, active control by the teacher and protection of students' personal data. The proposed methodology can serve as a basis for the comprehensive monitoring and assessment of students' learning outcomes in higher education institutions.

REFERENCES

1. Holmes W., Bialik M., Fadel C. Artificial Intelligence in Education: Promises and Implications for Teaching and Learning. Boston: Center for Curriculum Redesign, 2019.
2. Gašević D., Dawson S., Siemens G. Let's not forget: Learning analytics are about learning // TechTrends. 2015. Vol. 59, No. 1. DOI: 10.1007/s11528-014-0822-x.
3. Siemens G., Long P. Penetrating the Fog: Analytics in Learning and Education // EDUCAUSE Review. 2011. Vol. 46, No. 5. P. 30–40.
4. Zawacki-Richter O., Marín V.I., Bond M., Gouverneur F. Systematic review of research on artificial intelligence applications in higher education – where are the educators? // International Journal of Educational Technology in Higher Education. 2019. Vol. 16, Article 39. DOI: 10.1186/s41239-019-0171-0.

5. Hwang G.-J., Xie H., Wah B. W., Gašević D. Vision, challenges, roles and research issues of Artificial Intelligence in Education // Computers and Education: Artificial Intelligence. 2020. Vol. 1, Article 100001.
6. Luckin R., Holmes W., Griffiths M., Forcier L. B. Intelligence Unleashed: An Argument for AI in Education. London: Pearson, 2016.
7. Kochmar E., Vu D. D., Belfer R., Gupta V., Serban I. V., Pineau J. Automated Personalized Feedback Improves Learning Gains in an Intelligent Tutoring System // Artificial Intelligence in Education (AIED 2020). Lecture Notes in Computer Science. Vol. 12163. Cham: Springer, 2020.
8. Sadikova S., Rakhmatova N. Raqamli ta'lim muhitida sun'iy intellekt asosida baholash tizimlarini takomillashtirish // Jamiyat va innovatsiyalar – Society and Innovations. 2026. Vol. 7, No. 2. P. 317–321. DOI: 10.47689/2181-1415-vol7-iss2-pp317-321. (In Uzbek.)
9. Bakhtiyorova D. Talabalarning sun'iy intellektdan foydalanish ko'nikmalarini baholash mezonlari // Jamiyat va innovatsiyalar – Society and Innovations. 2025. Vol. 6, No. 2 (Special Issue 02). P. 569–576. DOI: 10.47689/2181-1415-vol6-iss2/S-pp569-576. (In Uzbek.)